

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION: GEUN-YOUNG YEOM, ET. AL.

FOR: METHOD OF ETCHING SEMICONDUCTOR DEVICE USING NEUTRAL  
BEAM AND APPARATUS FOR ETCHING THE SAME

AMENDMENT

The Assistant Commissioner of  
Patents and Trademarks  
Washington, DC 20231

Dear Sir:

Before examining the present application, please preliminarily amend the  
specification, claims and abstract as follows:

IN THE CLAIMS

Please replace claims 1-13 with the following rewritten versions:

1. (Amended) A method of etching a semiconductor device using a  
neutral beam comprising:  
extracting an ion beam having a predetermined polarity from an ion source to  
accelerate the ion beam;  
reflecting an accelerated ion beam by a reflector to neutralize the reflected ion  
beam; and  
positioning a substrate to be etched in a path of a neutral beam to etch a material  
layer on the substrate with the neutral beam.

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2. (Amended) The method of claim 1, further comprising adjusting an angle of incidence of the ion beam incident on the reflector before the reflecting.

3. (Amended) The method of claim 2, wherein the angle of incidence of the ion beam incident on the reflector is within the range of 75 - 85° from a vertical line to a horizontal surface of the reflector.

4. (Amended) The method of claim 3, further comprising adjusting a gradient of the reflector to an incident ion beam.

5. (Amended) The method of claim 3, further comprising applying a voltage to the reflector to adjust a path of an incident ion beam.

6. (Amended) The method of claim 1, wherein the reflector is selected from the group consisting of a semiconductor substrate, a silicon dioxide substrate and a metal substrate.

7. (Amended) An apparatus for etching a semiconductor device using a neutral beam, the apparatus comprising:  
an ion source for extracting and accelerating an ion beam having a predetermined polarity;  
a reflector positioned in a path of the ion beam accelerated from the ion source for reflecting and neutralizing the ion beam; and  
a stage for positioning a substrate to be etched in a path of the neutral beam.

8. (Amended) The apparatus of claim 7, wherein the ion source is an inductively coupled plasma source.

9. (Amended) The apparatus of claim 7, wherein the reflector comprises a plurality of plates which are spaced apart from each other to reflect the ion beam.

10. (Amended) The apparatus of claim 7, wherein the reflector comprises a plate which is tiltable to adjust an angle of incidence of an incident ion beam to a horizontal surface of the plate.

11. (Amended) The apparatus of claim 7, wherein the reflector comprises a plurality of cylindrical reflecting members.

12. (Amended) The apparatus of claim 7, further comprising a position control means for adjusting a position of the stage corresponding to the path of the neutral beams reflected by the reflector.

13. (Amended) The apparatus of claim 7, wherein the reflector is selected from the group consisting of a semiconductor substrate, a silicon dioxide substrate, and a metal substrate.

Please insert the following newly added claims 16 and 17.

16. (Newly Added) The apparatus of claim 7, wherein the ion source comprises a grid at a rear of the ion source.

17. (Newly Added) The apparatus of claim 11, wherein the cylindrical reflecting members are overlapped, and adjacent reflectors have different polarities.

REMARKS

Applicants request entry of the present amendments which conform the claims to U.S. practice. No new matter is being introduced by this Amendment as antecedent support is set forth in the original specification and in the original claims.

Prosecution on the merits is respectfully requested.

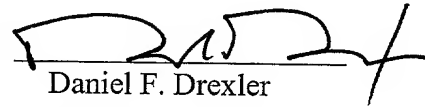
The Examiner is invited to contact Applicants' attorney at the below-listed telephone number regarding this Preliminary Amendment or otherwise regarding the present application.

If there are any charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,  
GEUN-YOUNG YEOM, ET. AL.

CANTOR COLBURN LLP  
Applicants' Attorneys

By:



Daniel F. Drexler  
Registration No. 47,535  
Customer No. 23413

Date: November 8, 2001  
Address: 55 Griffin Road South, Bloomfield, CT 06002  
Telephone: 860-286-2929

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

IN THE CLAIMS:

Claims 1-13 are amended herein as follows:

Please replace claims 1-13 with the following rewritten versions:

1. (Amended/Marked up) A method of etching a semiconductor device using a neutral beam comprising:

extracting an ion beam having a predetermined polarity from an ion source to accelerate the ion beam;

reflecting an accelerated ion beam by a reflector to neutralize the reflected ion beam; and

positioning a substrate to be etched in [the] a path of a neutral beam to etch a [special] material layer on the substrate with the neutral beam.

2. (Amended/Marked up) The method of claim 1, [wherein the step of neutralizing the ion beams is performed after] further comprising adjusting [the] an angle of incidence of the ion beam incident on the reflector before the reflecting.

3. (Amended/Marked up) The method of claim 2, wherein the angle of incidence of the ion beam incident on the reflector is within the range of 75 - 85° from [the]a vertical line to [the]a horizontal surface of the reflector.

4. (Amended/Marked up) The method of claim 3, [wherein the step of neutralizing the ion beam is performed after] further comprising adjusting [the] a gradient of the reflector to an incident ion beam.

5. (Amended/Marked up) The method of claim 3, [wherein the step of neutralizing the ion beam is performed after] further comprising applying a voltage to the reflector to adjust [the] a path of an incident ion beam.

6. (Amended/Marked up) The method of claim 1, wherein the reflector is [one of] selected from the group consisting of a semiconductor substrate, a silicon dioxide substrate and a metal substrate.

7. (Amended/Marked up) An apparatus for etching a semiconductor device using a neutral beam, the apparatus comprising:  
an ion source for extracting and accelerating an ion beam having a predetermined polarity;  
a reflector positioned in [the] a path of the ion beam accelerated from the ion source for reflecting and neutralizing the ion beam; and  
a stage for positioning a substrate to be etched in [the] a path of the neutral beam.

8. (Amended/Marked up) The apparatus of claim 7, wherein the ion source is an inductively coupled plasma source[, and a grid is formed to accelerate the ion beam at the rear of the ion source].

9. (Amended/Marked up) The apparatus of claim 7, wherein the reflector [is formed of] comprises a plurality of plates which are spaced apart from each other to reflect the ion beam.

10. (Amended/Marked up) The apparatus of claim 7, wherein the reflector [is formed of] comprises a plate which [may be tilted] is tiltable to adjust [the] an angle of incidence of an incident ion beam to [the] a horizontal surface of the plate.

11. (Amended/Marked up) The apparatus of claim 7, wherein the reflector [is formed of] comprises a plurality of cylindrical reflecting members [reflectors, which are overlapped, of which adjacent reflectors have different polarities].

12. (Amended/Marked up) The apparatus of claim 7, further comprising a position control means [wherein] for adjusting a [the] position of the stage [is adjusted] corresponding to the path of the neutral beams reflected by the reflector.

13. (Amended/Marked up) The apparatus of claim 7, wherein the reflector is [one of] selected from the group consisting of a semiconductor substrate, a silicon dioxide substrate, and a metal substrate.